Quality Assurance Project Plan (QAPP)

Avery Landing Site
Avery, Idaho

for
Potlatch Forest Holdings, Inc.

August 30, 2011

GeoEngineers
Earth Science + Technology

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30 YEARS 2010

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Avery Landing Site
Avery, Idaho

File No. 2315-017-00

August 30, 2011

Approved By:

Signature: Date: August 30, 2011

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Signature: Date: August 30, 2011

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Signature: Date: August 30, 2011

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LIST OF ACRONYMS

AOC	Agreement and Order on Consent
CCAL	Continuing Calibration
COC	Chain of Custody
cPAH	Carcinogenic Polycyclic Aromatic Hydrocarbon
CPR	Cardiopulmonary Resuscitation
EDD	Electronic Data Deliverable
EE/CA	Engineering Evaluation/Cost Assessment
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
LCS	Laboratory Control Sample
MQO	Measurement Quality Objective
MRL	Method Reporting Limits
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MSR	Matrix Spike Recovery
PAH	Polycyclic Aromatic Hydrocarbon
PCB	Polychlorinated Biphenyl
PPB	Parts Per Billion
PPM	Parts Per Million
PPE	Personal Protective Equipment
PSS	Petroleum Saturated Soil
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
RPD	Relative Percent Difference
SDG	Sample Delivery Group
SSSP	Site Specific Sampling Plan
SVOC	Semivolatile Organic Compound
U.S. EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

INTRODUCTION

This document presents the Quality Assurance Project Plan (QAPP) for the Avery Landing Site (Site), located approximately 0.75 miles west of Avery, Idaho. This QAPP is to be used in conjunction with the Site Specific Sampling Plan (SSSP), dated August 30, 2011.

The QAPP was prepared in general accordance with the requirements of 40 CFR 300.415(b)(4)(ii) and "EPA Requirements for Quality Assurance Project Plans," (QA/R-5) (EPA/240/B-01/003 2001), and "EPA Guidance for Quality Assurance Project Plans" (QA/G-5) (EPA/600/R-98/018 1998) as required by the Administrative Settlement Agreement and Order on Consent No. CERCLA-10-2008-0135 entered into by Potlatch Corporation, Potlatch Forest Products Corporation and the United States Environmental Protection Agency (EPA) in July 2008.

The project management (Group A) elements of the QAPP as detailed below address the basic area of project management including the project history, team objectives, roles and responsibilities of the participants. This element of the plan ensures that the project has a defined goal, and that all participants understand this goal and that the planning outputs have been documented.

A4 PROJECT/TASK ORGANIZATION

An organization chart showing the key individuals who will provide technical support and management and the lines of authority and communication are presented in Figure 1. The specific roles and responsibilities of these individuals and their qualifications are summarized as follows:

Regulatory Project Manager - Earl Liverman is the Regulatory Project Manager and On-scene Coordinator. The Regulatory Project Manager is responsible for overseeing the implementation of the work to be performed under the Administrative Settlement Agreement and Order on Consent.

Regulatory Quality Assurance Manager - The Regulatory Quality Assurance Manager will review and approve the QAPP and subsequent revisions and amendments. The Regulatory Quality Assurance Manager provides quality assurance (QA) oversight and technical support to the Regulatory Project Manager regarding project design and project implementation. The Regulatory Quality Assurance Manager will be identified by the Regulatory Project Manager.

Project Principal – The Project Principal is responsible for fulfilling contractual and administrative control of the project. The Project Principal's duties include defining the project approach and tasks, selecting project team members and establishing budgets and schedules. John Herzog (206.406.6431) is the Project Principal.

Project Manager – The Project Manager's duties consist of implementing the project approach and tasks, overseeing project team members during performance of project tasks, adhering to and communicating the status of budgets and schedules to the Project Principal, providing technical oversight, and providing overall production and review of project deliverables. The Project Manager shall maintain the official, approved SSSP/QAPP and shall be responsible for distributing updated documents to the recipients listed in Section A3. Iain Wingard (253.722.2417) is the Project Manager for activities at the Site.

On-Site Field Coordinator – The On-Site Field Coordinator will lead the field sampling effort for the project, serving as the direct point of contact between the Project Manager, analytical laboratory, and subcontractors and ensures that the appropriate sampling containers, chain-of-custody (COC) forms and field sampling gear including personal protective equipment (PPE) are available. The On-Site Field Coordinator is to ensure that data collection activities are consistent with information requirements and to assure that field information is correctly and completely reported for the entire duration of the project. The On-Site Field Coordinator will also perform appropriate sampling, testing, and measurement procedures and schedule sample delivery/shipment with the analytical laboratory. The On-Site Field Coordinator will transfer field data and sample tracking forms to the Project Manager for data reduction and validation and participate in QA corrective actions as required. The On-Site Field Coordinator is John Haney (509.363.3125).

Health and Safety Manager – The Health and Safety Manager will oversee implementation of health and safety programs and verify that work on the project proceeds in accordance with the site-specific health and safety plan. The Health and Safety Manager is Wayne Adams (253) 383-4940.

Quality Assurance Leader – The Quality Assurance Leader (also known as the Environmental Data Management Coordinator) will provide oversight required for the completion of sample analyses for the project and verify, in conjunction with the laboratory manager, that the analytical work is proceeding in accordance with internal laboratory standard practices and the quality assurance / quality control (QA/QC) guidelines for the project. This person will also oversee completion of data validation activities completed for this project. The Quality Assurance Leader maintains independence from the individual(s) generating the data. Mark Lybeer will serve as the Quality Assurance Leader.

Laboratory Project Manager – The Laboratory Project Manager will fulfill the analytical requirements of this project including being responsible for sample analyses using appropriate analytical laboratory methods. The specific procedures to be used for COC transfer, internal calibrations, laboratory analyses, reporting, preventive instrument maintenance, and corrective action will follow standard protocols. The Laboratory Project Manager will be Sue Dunihoo from Analytical Resources, Inc. in Tukwila, Washington.

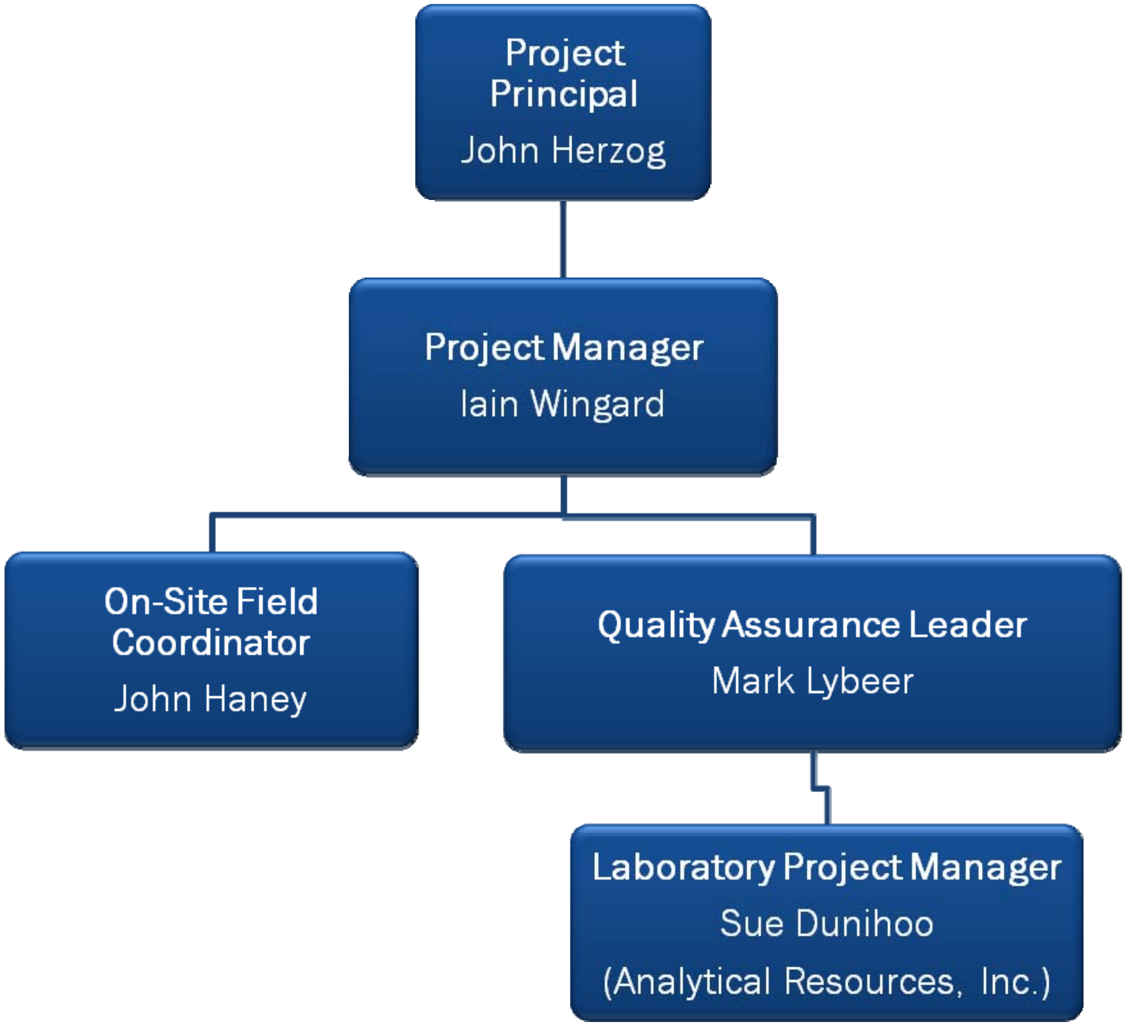

Figure 1. Organization Chart

A5 PROBLEM DEFINITION/BACKGROUND

A5.1 Purpose/History

A5.1.1 Purpose

The following are the purposes for the present investigation and field activities:

1. To perform soil investigation activities (test pit excavation) and soil sampling and analysis to support delineation of two areas on the western portion of the Site where petroleum hydrocarbon product and/or sheen were observed during previous investigations.
2. To perform depth-to-product and/or depth-to-groundwater measurements in existing Site monitoring wells and piezometers to assess the presence of petroleum product on groundwater.

3. To perform decommissioning of the former domestic water supply well located at the Site in accordance with applicable regulations.

A5.1.2 History

The Site is the former location of a railroad roundhouse and maintenance facility for the Chicago, Milwaukee, St. Paul, and Pacific Railroad (Milwaukee Railroad). Railroad operations at the Site ceased in the 1970s and the railroad facilities and structures were subsequently demolished.

The Site has been the subject of multiple environmental investigations. Petroleum hydrocarbons have been identified in Site soil and groundwater, and sediment in the St. Joe River. Petroleum hydrocarbon sheen has also been observed in an area where groundwater seeps into the St. Joe River. Additionally, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), carcinogenic and non-carcinogenic polycyclic aromatic hydrocarbons (cPAHs and PAHs), polychlorinated biphenyls (PCBs) and metals have been detected in Site media in association with the petroleum hydrocarbon contamination. The results of investigations of the Site are presented in the draft Engineering Evaluation/Cost Analysis (EE/CA) report prepared by Golder and Associates (Golder, 2010) for Potlatch and draft final EE/CA report prepared by Ecology and Environment for EPA (E&E, 2010).

The Site is subject to an Administrative Settlement Agreement and Order on Consent No. CERCLA-10-2008-0135 entered into by Potlatch Corporation, Potlatch Forest Products Corporation and the EPA.

A5.2 Problem Statement/Background

An Action Memorandum for the Avery Landing Site was published by EPA on July 5, 2011. The Action Memorandum specifies remedial activities to be performed to complete a non-time critical removal action at the Site. Cleanup of the Avery Landing Site is currently anticipated to be performed in 2012.

Two discrete areas on the western portion of the Site have been observed to contain evidence of petroleum hydrocarbon product and/or sheen in soil during previous investigations. The two areas are identified on Figure 1 of the SSSP. One area encompasses the previous investigation location TP-03 and the second area encompasses previous investigation locations TP-06 and GA-3. The extent of petroleum hydrocarbon contamination has not been delineated in these two areas. As part of the current investigation, test pit excavation and soil sampling and analysis will be performed to further delineate the extent of petroleum hydrocarbon contaminated in the two areas to support evaluation of remedial actions on the western portion of the Site.

Petroleum hydrocarbon product has been measured and/or observed on groundwater during multiple previous investigations on the eastern portion of the Site. As part of the planned investigation, measurements of the depth to product/depth to groundwater in existing wells will be performed to provide a current assessment of the presence and extent of petroleum product on groundwater at the Site.

A well that was formerly used for domestic water supply still exists on the western portion of the Site. As part of the current field activities, the former domestic water supply well will be decommissioned.

A6 PROJECT/TASK DESCRIPTION

Investigation activities are anticipated to take place during the week of September 19th, 2011.

Test pit excavation and soil sampling and analysis will be performed to further characterize the extent of petroleum saturated soil in the two discrete locations on the western portion of the Site. Between nine and 12 test pits are anticipated to be excavated at locations positioned radially around existing sample locations on the western portion of the Site (i.e., TP-03, TP-06, and GA-3) that were previously observed to contain evidence of petroleum product and/or sheen. Initially, nine test pits will be excavated in locations positioned radially the around previous sample locations. Visual observations of the presence of petroleum hydrocarbons in soil will be recorded on test pit logs. EPA representatives are expected to be at the Site during the investigation. The field observations will be discussed with EPA in the field to allow for consistency in the observations of petroleum product and/or sheen evidence and to establish a common understanding of the nature of contamination at the Site.

Additional test pits may be excavated at a distance further away from the previous sample locations on the western portion of the Site (i.e., TP-03, TP-06, and GA-3) and test pits excavated as part of this investigation if evidence of product and/or sheen is observed in the initial test pit locations. The secondary test pits will be used to further delineate and bound the extent of observed contamination.

Selected soil samples from each of the test pits where observations indicate that the furthest extent or limits of petroleum saturated soil have been reached will be submitted for chemical analysis for the following:

- Diesel- and heavy oil-range petroleum hydrocarbons by Ecology Method NWTPH-Dx
- VOCs by EPA Method 8260
- SVOCs by EPA Method 8270/SIM
- PCBs by EPA Method 8082
- Target Analyte List (TAL) metals by EPA Method 6000/7000 series

Field work also includes measuring depth-to-product and/or depth-to-groundwater in Site monitoring wells and piezometers and decommissioning of a former domestic water supply well.

A6.1 General Tasks

The general tasks to be performed include; preparation of a site specific sampling and analysis plan (SSSP), Health and Safety Plan (HASP), and this QAPP; test pit excavation and soil sampling; sample analysis; depth-to-product/depth-to-groundwater measurements; former domestic water supply well decommissioning; sample analysis; data validation; data analysis and interpretation; and reporting.

The specific project schedule is shown in the table below.

A6.2 Specific Project Schedule

Tasks/Activities	Estimated Start Date	Estimated Completion Date	Comments
1. Preparation of Draft SSSP/QAPP	8/1/2011	8/12/2011	
2. Review of Draft SSSP/QAPP and preparation of Final SAP/QAPP	8/16/2011	9/2/2011	
3. Test pit excavation, water/product measurements, and water supply well decommissioning	9/19/2011	9/23/2011	
5. Sample Analysis	9/26/2011	10/10/2011	
6. Data Validation	10/11/2011	10/24/2011	
7. Data Analysis and Interpretation	10/17/2011	10/31/2011	
8. Report Writing	10/17/2011	11/1/2011	
9. Report Submission to EPA	11/1/2011	11/1/2011	

A7 DATA QUALITY OBJECTIVES CRITERIA

The quality assurance objectives for technical data are to collect environmental monitoring data of known, acceptable, and documentable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for precision, accuracy, representativeness, completeness, and comparability, and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures, and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (bias, sensitivity, precision, accuracy, and completeness) and qualitative factors (representativeness and comparability). The measurement quality objectives

(MQO) associated with these data quality factors are summarized in Table 1 and are discussed below.

A7.1 Sensitivity

The primary measurement quality objective for this project is to analyze for chemicals at Practical Quantitation Limits (PQLs) less than target reporting limits (TRLs). These limits are provided in Table 2. In order to meet these TRLs, the laboratory will report the analyte concentrations detected at or above the Method detection Limits (MDLs) but less than Method Reporting Limits (MRL) as "estimated."

A7.2 Accuracy and Bias

Accuracy is a statistical measurement of correctness and includes components of random error (variability due to imprecision) and systemic error. It reflects the total error associated with a measurement. A measurement is accurate when the value reported does not differ from the true value or known concentration of the spike and standard. Analytical accuracy is measured by comparing the percent recovery of analytes or surrogates spiked into a sample or QC sample [matrix spike (MS), matrix spike duplicate (MSD) or laboratory control sample (LCS)] to the control limits listed in Table 1. Accuracy is calculated using the following formula:

%R=100(xs -xu)/K

Where, %R = percent recovery of spike (also known as matrix spike recovery [MSR]).

xs = measured value for spiked sample.

xu = measured value for unspiked sample.

K = known value of the spike in the sample.

Bias is a systemic or persistent distortion of a measurement process that causes errors in one direction. It usually is associated with the idea of obtaining data that will lead to a consistently "low" or consistently "high" concentration of a given target analyte.

A7.3 Precision

Precision measures the reproducibility of the measurements calculated using the data generated in the analysis of laboratory duplicate samples. Each duplicate analysis will be recorded on the appropriate form, and the equations used to calculate the precision of data should be included. If the difference of the value between two duplicate samples exceeds the MQOs (Table 1), then the precision should be judged to be out of control and the analyst should be instructed to confirm the source of the precision error. Once confirmed and remedied, the analysis will be rerun providing acceptable precision limits, and the data can then be reported.

Precision is measured using the relative percent difference (RPD) from pairs of duplicate measurements, calculated as follows:

%RPD = 100(d1– d2)/[(d1 + d2)/2]

Where:

%RPD = percent relative difference.

d1 and d2 = the concentrations of the two measurements.

RPD can be calculated using duplicate analyses in the case where an analyte is detected. If an analyte is not detected, the RPD can be calculated from the percent recoveries of the matrix spike (MS) and matrix spike duplicate (MSD) analyses.

A7.4 Completeness

Completeness is calculated for the aggregation of data for each analyte measured for any particular sampling event or other defined set of samples. Completeness is calculated and reported for each method, matrix, and analyte combination. The number of valid results divided by the number of possible individual analyte results, expressed as a percentage, determines the completeness of the data set. For completeness requirements, valid results are all results not rejected through data validation. For this project, the requirement for completeness is 90 percent (%).

The following equation is used to calculate completeness:

$$\%\ \text{completeness} = \frac{\text{number of valid results} \times 100}{\text{number of possible results}}$$

For instances when samples could not be analyzed (i.e., because of holding time violations for which re-sampling and analysis were not possible, samples that were spilled or broken, etc.), the numerator of this equation becomes the number of valid results minus the number of possible results not reported.

A7.5 Comparability

Comparability is the qualitative term that expresses the measure of confidence that two data sets or batches can contribute to a common analysis and evaluation. Comparability with respect to laboratory analyses pertains to method type comparison, holding times, stability issues, and aspects of overall analytical quantitation. The following items are evaluated when assessing data comparability:

- Whether two data sets or batches contain the same set of parameters.
- Whether the units used for each data set are convertible to a common scale.
- Whether similar analytical procedures and quality assurance were used to collect data for both data sets.
- Whether the analytical instruments used for both data sets have approximately similar detection levels.
- Whether samples within data sets were selected and collected in a similar manner.

To ensure data comparability, standard sample collection and analytical methods/procedures will be used for this project.

A7.6 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, a process condition, an environmental condition, or parameter variations at a sampling point.

Representativeness is assessed by way of evaluating issues such as (but not limited to) sampling methods, analytical methods used, holding times, laboratory blanks, field blanks, COC records, detection limits, and sample dilutions. The field QA/QC procedures for sample handling, including COC records, will provide for sample integrity until the time of analysis. To make certain that the analytical results of this assessment are representative of the true field conditions, appropriate laboratory QA/QC procedures (as indicated in this QAPP) should be followed.

The degree to which the data are representative of the field conditions will be evaluated during the Quality Assurance Leader's review of the analytical data. The results of the validation review will be summarized in the Data Validation Report.

A8 SPECIAL TRAINING/CERTIFICATIONS

The On-Site Field Coordinator will be up-to-date on his Hazardous Waste Operations and Emergency Response (HAZWOPER) training and will be certified in cardiopulmonary resuscitation (CPR) and first aid. This training is provided via online and in-class annual or biennial training. All field staff will be knowledgeable in and understand the proper technical protocols for collecting soil samples for all analytes including petroleum hydrocarbons, VOCs, SVOCs, PCBs and metals.

Records documenting HAZWOPER and CPR/First Aid certifications are documented in the site health and safety plan and are also kept by the Health and Safety Manager.

A9 DOCUMENTATION AND RECORDS

The approved final SSSP/QAPP will be maintained in electronic format by the Project Manager, in Microsoft Word© format and in an Adobe portable document format (PDF). One hard copy of the SSSP/QAPP will be utilized by field staff to ensure consistency with protocols.

The following documents will be produced during this investigation:

- Daily field report that documents field sampling activities performed by the On-Site Field Coordinator and maintained in both electronic and hard copy formats. The field report will include information on field forms or in the field notebook including test pit logs, depth-to-product/depth-to-groundwater measurements, and well decommissioning records. Other information included in the field report is listed in Section B2.4.
- A draft and final technical memorandum detailing the results of the field activities will be prepared after receipt of the analytical data.

Records will be retained by GeoEngineers, Inc. in hard copy and in electronic Microsoft Word and/or PDF format for at least 10 years. Electronic data is backed up daily in-office and also sent to a centralized data center for off-site storage.

Individuals identified in Section A3 will receive updated versions of the SSSP/QAPP electronically (via email with attached pdf). The Project Manager will distribute the updated documents as they become available.

GROUP B - DATA GENERATION AND ACQUISITION

The data generation and acquisition (Group B) elements of the QAPP (as detailed below) address aspects of the project design and implementation including the appropriate methods for sampling, measurement and analysis, data collection or generation, data handling, and how QC activities are employed and properly documented.

The information presented herein applies directly to the selection of sampling locations and field sampling methodology. The sample nomenclature, the number of samples to be collected, and the rationale for sampling and choosing the appropriate sample locations are presented in this section of the QAPP. Sampling methods including field documentation, sampling and decontamination procedures, are also discussed below.

B1 SAMPLE PROCESS DESIGN (EXPERIMENTAL DESIGN)

B1.1 Test Pit Investigation

The objective of the test pit investigation is to further delineate the extent of petroleum saturated soil in the vicinity of two areas located on the western portion of the Site. The proposed test pit locations are presented in Figure 1 of the SSSP. Confirmation soil sampling will be performed in multiple test pits to collect samples representative of the vadose zone soil and soil at the groundwater table where evidence of petroleum saturated soil is no longer observed to be present.

Initially nine test pit locations will be excavated (Figure 1 of the SSSP). Additional “step out” test pits may also be excavated if petroleum saturated soil is observed in the initial test pits. The additional step out test pits will be excavated at locations further away from the locations where evidence of petroleum product and/or sheen is observed in the initial test pits excavated as part of this investigation. The secondary test pits will be used to further delineate and bound the extent of observed contamination.

Two soil samples will be collected (one in the vadose zone and one at the groundwater table) from each of the completed test pits where observations indicate that the furthest extent or limits of petroleum saturated soil have been reached. Selected samples will be analyzed for the constituents indicated in Section A6.

The test pit locations may be adjusted based on field conditions (i.e. if obstructions prevent excavating a test pit in the planned location). If adjustments are necessary, the test pit will be excavated as close to the planned location as is feasible.

B1.2 Monitoring Well and Piezometer Measurements

The objective of the monitoring well and piezometer measurements is to obtain depth-to-product and/or depth to water measurements in all known and existing Site monitoring wells and piezometers to assess the presence of petroleum product on groundwater. Measurements will be obtained using an oil/water interface probe. The oil/water interface probe will be lowered down into each well and piezometer casing until the probe alarm indicates the first presence of product or water. The depth to product or water will be measured to the nearest hundredth of a foot (i.e., 0.01 foot). If product is initially indicated to be present by the probe alarm and after the depth to product has been recorded, the interface probe will be lowered until the probe alarm indicates the presence of water. The depth to water will then be measured to the nearest hundredth of a foot and recorded, All measurements will be taken from top of casing on the north side of the casing (i.e., side closest to St. Joe River Road/National Forest Service Road 50).

Disposable plastic bailers will be available in the event that product thickness is difficult to gauge using the oil/water interface probe alone (i.e. if product is very viscous or otherwise difficult to gauge using the probe).

B1.3 Well Decommissioning

The objective of the domestic water supply well decommissioning is to permanently decommission the well. A driller that is licensed in the State of Idaho will decommission the well in accordance with applicable regulations.

B2 SAMPLING METHODS

This section discusses the methodologies that will be used, and the Standard Operating Procedures that will be followed for sample collection, sample nomenclature, sample handling, COC preparation and decontamination.

B2.1 Sampling Equipment and Decontamination Procedures

Soil samples will be collected directly from the test pits, which will be excavated using standard excavation equipment (i.e., backhoe or excavator). Soil samples collected from test pits at depths less than approximately 4 feet below ground surface (bgs) will be collected by the On-Site Field Coordinator by directly entering the test pit if it is safe to do so and using hand tools (i.e. stainless steel spoons). If it is not safe to enter a test pit, or where samples are to be collected from depths greater than 4 feet bgs, samples will be collected from material present in the excavator or backhoe bucket. Samples collected from the excavation equipment will be collected from the approximate middle of the excavator or backhoe bucket (i.e., material that has not come in contact with the bucket) using stainless steel spoons. Whether sampling the sidewall of the test pit or soil in the excavator bucket, approximately 6 to 12 inches of soil will be removed before collecting a sample to avoid sampling soil where VOC loss may have occurred.

Care will be made to collect samples representative of Site conditions including avoidance of cross-contamination between sample locations during field activities. The following decontamination procedures will be implemented during field activities to avoid cross-contamination:

- Disposable sampling equipment will be used when possible to minimize decontamination requirements. Non-disposable sampling equipment (i.e. stainless steel spoons and bowls) will be decontaminated prior to and after use. Decontamination procedures for this equipment will consist of the following:
    1. Washing with a brush and non-phosphate detergent solution (e.g., distilled water and Alconox or Liqui-Nox);
    2. Rinsing in a container of distilled water;
    3. A final rinse by pouring distilled water over the equipment; and
    4. Wrapping the decontaminated equipment in aluminum foil and placing the equipment in a disposable plastic bag for storage.
- Field sampling team members will use nitrile gloves and change them between each sample interval and sample location to prevent cross contamination.
- Pre-cleaned, QA-tested, and previously unused sample jars provided by the Laboratory will be used to contain samples.
- Sample containers will be labeled immediately before they are used to contain a sample. Samples will be assembled and documented according to appropriate COC procedures prior to delivering to the Laboratory including custody seals on each cooler in the event that the On-Site Field Coordinator or Project Manager is not the person delivering the containers.

Depth-to-product/depth-to-groundwater measurements will be performed using an oil/water interface probe. The probe will be inserted into a well/piezometer and lowered to the oil/water surface(s). The interface probe will be decontaminated between measurements at each well/piezometer using the following procedures:

1. Wiping the interface probe equipment (i.e., tape and indicator probe) with paper towel from the tape down to the end of the indicator probe to remove the visible petroleum product.
2. Washing any portion of the probe (i.e., tape and indicator probe) that enters the well with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water);
3. Rinse with distilled water
4. If necessary to ensure complete removal of residual LNAPL, measuring devices may also be cleaned with acetone or isopropyl alcohol (IPA) at this stage. If acetone or IPA is used, steps 2 and 3 (with fresh solutions) will be repeated.

Decontamination water will be stored on Site in a labeled, secure drum(s).

B2.2 Field Screening

The potential presence of contamination in soil samples will be evaluated using field screening techniques. Field screening results will be recorded on the test pit logs and the results will be used to delineate areas of soil contamination. In addition, screening results will be used as a basis for selecting soil samples for chemical analysis. The following screening methods will be used: (1) visual and olfactory screening; (2) water sheen screening; and (3) headspace vapor screening.

VISUAL AND OLFACTORY SCREENING

Visual and olfactory screening of soil for indications of petroleum hydrocarbon contamination will include the following:

- Observation for and documentation of staining including color (i.e., gray, etc.), area of stained soil (i.e., measurement of the depth interval of staining), any layering or other characteristics of the staining including characteristics indicating if the material appears to be a source of petroleum contamination to groundwater.
- Observations for and documentation of petroleum product including color, viscosity, area of staining (i.e., measurement of the depth interval of product), layering, or other characteristics of the product including characteristics indicating if the material appears to be a source of petroleum contamination to groundwater (i.e., presence of free product discharging from soil, product droplets, etc.).
- Observations for and documentation of petroleum sheen on the soil prior to water sheen screening (as described below) including color, area of sheen (i.e., measurement of the depth interval of sheen), or other characteristics of the sheen including the sheen appears to be a source of petroleum contamination to groundwater (i.e., sheen discharging from soil, etc.).
- Documentation of odors including strength, type (i.e., diesel, oil, etc.), area of odors (i.e., depth interval of odor), changes in odor and any other characteristics of the odor.

Additionally, any odors detected in Site monitoring wells/piezometers will be recorded during depth-to-product/depth-to-water measurements.

WATER SHEEN SCREENING

Water sheen screening involves placing a portion of the soil sample in a pan containing distilled water, and observing the water surface for signs of sheen. This is a relatively sensitive, qualitative field screening method that can help identify the presence or absence of petroleum hydrocarbons and other contaminants, sometimes at concentrations lower than regulatory cleanup guidelines. The following sheen classifications will be used:

Classification	Identifier	Description
No Sheen	(NS)	No visible sheen on the water surface.
Slight Sheen	(SS)	Light, colorless, dull sheen; spotty to globular; spread is irregular, not rapid; sheen dissipates rapidly; areas of no sheen remain.
Moderate Sheen	(MS)	Light to heavy sheen; may have some color/iridescence; globular to stringy; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface.
Heavy Sheen	(HS)	Heavy sheen with color/iridescence; stringy; spread is rapid; entire water surface may be covered with sheen; sheen flows off the sample.

Similar to other visual screening observations, the depth interval where sheen was observed based on water sheen screening will be documented on the test pit logs.

HEADSPACE VAPOR SCREENING

This is a semi-quantitative field screening method that can help identify the presence or absence of VOCs in soil samples. A portion of the soil sample will be placed in a resealable plastic bag. The bag will then be sealed to the extent practicable, capturing air in the bag. The bag is then shaken gently to expose the soil to the air trapped in the bag. The probe of a photoionization detector (PID) will then be inserted through a small opening in the bag, taking care not to clog the probe with soil. The maximum PID reading (in parts per million [ppm]) will be recorded on the field log for each sample. The PID will be calibrated to 100 ppm isobutylene each day prior to soil sampling. No soil sample used for headspace screening will be submitted to the laboratory for chemical analysis.

B2.3 Analyte-Specific Considerations

For sample containers which may have preservative (e.g. VOCs), caution will be exercised to avoid spilling the preservative.

Staff will be trained in the correct methodology for collecting soil samples for VOC analysis in accordance with EPA Method 5035 requirements. As described in Section B.2.1, approximately 6 to 12 inches of soil will be removed before collecting a sample to avoid VOC loss. A disposable soil plunger will be used to collect the required amount of soil. Soil will be placed into a pre-weighed (at the laboratory) container and sealed tightly to avoid VOC loss.

B2.4 Field Documentation

The On-Site Field Coordinator will be responsible for documenting field sampling activities in an all-weather (e.g. “Rite-in-the-Rain”) field notebook and on test pit logs, and by producing a draft technical field report at the end of each day of sampling. The On-Site Field Coordinator will also be responsible for implementing field QA/QC procedures in accordance with the methods outlined in this QAPP and general good practice sampling protocols. These procedures include recording and documenting relevant and appropriate information regarding project activities, sampling methods and data collected during performance of field activities at each sample location.

The following general guidelines should be followed in documenting fieldwork:

- Documentation will be maintained in a dedicated field notebook and on test pit logs.
- Notebook documentation will be completed in pencil and written errors will be crossed out with a single line.

Field notebooks will include records of pertinent activities related to specific sampling tasks. They will be bound books with sequentially numbered pages. The books will remain in the custody of the On-Site Field Coordinator until project completion, after which, the books will be kept in the project files.

The field notebook and test pit logs will be maintained on a real-time basis and will include, where applicable and appropriate, the following information:

- Date, time of specific activities and weather conditions.
- Names of all personnel on the site, including visitors.

- Specific details regarding sampling activities, including sampling locations, type of sampling, depth, and sample numbers.
- Specific problems and resolutions.
- Identification numbers of monitoring instruments used that day.
- Chain-of-custody details, including sample identification numbers.

A draft field report will be prepared upon completion of field sampling activities each day. Field data that was recorded in the notebooks and test pit logs will be used to complete the field report.

B2.5 Sample Nomenclature

Samples will be identified according to station and sampling sequence. Sample designations will be such that they can be entered into the GeoEngineers environmental data management system in order to facilitate management, recovery, and reporting of data. For this sampling event, sample nomenclature will follow this convention:

Station designation – Depth interval

For example, a sample collected from the 10 to 11 foot interval at TP-08 would be labeled TP-08-10-11.

B2.6 Sample Preservation, Container and Hold Times

Samples will be prepared, containerized, and preserved in the field in accordance with the guidelines described in Table 3.

Samples will be kept on ice in coolers from the time of collection until delivery to the Laboratory. The samples will be preserved and hand delivered by the On-Site Field Coordinator, Project Manager or courier to the laboratory. Alternatively, samples may be packaged and shipped to the laboratory. Samples will be kept at 0°to 6°C during delivery to the Laboratory and in refrigerated coolers while at the Laboratory until analyzed.

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis of soil sample is exceeded, then the possibility exists that some of the organic constituents may have volatilized from the sample or degraded. Results for that analysis would be qualified as estimated to indicate that the reported results may be lower than actual Site conditions. Holding times are presented in Table 3.

B2.7 Discrepancies

In the event that changes become necessary to the fieldwork planned in the SSSP/QAPP, the On-Site Field Coordinator will discuss changes with the Project Manager. Changes that may significantly change the experimental design will not be implemented until they are discussed between the Project Manager and the Regulatory Project Manager.

B3 SAMPLE HANDLING AND CUSTODY

The On-Site Field Coordinator or Project Manager will be responsible for the care and custody of the samples until they are delivered or shipped to the Laboratory. Sample labels will be placed on all sample containers and will include the following information:

- Project Name or Number
- Sample identification number (nomenclature)
- Date and time

In addition to the above, COC records will be prepared and included in each cooler of samples delivered or shipped to the Laboratory. The COC procedures will be implemented in such a way as to document sample possession from the time of sample collection until sample disposal by the Laboratory.

A sample will be considered in custody if it is:

- In the physical possession or view of the On-Site Field Coordinator or Project Manager or
- Sealed and placed in a secure place after having been in physical possession.

The COC record will contain the same information as is contained on the sample labels and serve as documentation of sample handling during delivery or shipment. One copy of this custody record will remain with the shipped samples, and one copy will be retained by the On-Site Field Coordinator who originally sampled and relinquished the samples. The sampler's copy will be maintained in the project file.

The samples relinquished to the Laboratory will be subject to transfer-of-custody and shipment procedures, as follows:

- The samples shipped to the Laboratory will be accompanied by a COC record documenting which samples are present in the cooler. When transferring possession of samples, the individuals relinquishing and receiving the samples will sign, date, and note the times of the sample transfer on the record. This custody record will document transfer of sample custody from the sampler to other persons, including the Laboratory.
- The samples will be properly packed for shipment and dispatched to the Laboratory for analysis, with a separate, signed COC enclosed in each sample cooler. If the On-Site Field Coordinator is not the person delivering the sample coolers to the Laboratory, sample shipping containers will be custody-sealed before being delivered to the Laboratory. The preferred procedure for custody sealing includes use of a custody seal placed across filament tape that is wrapped around the cooler at least twice. The custody seal should then be folded over and attached to itself in such a way as the package can only be accessed by cutting the filament tape or breaking the seal. The seal will be signed by the On-Site Field Coordinator.

Samples will be shipped within proper hold times, which are listed in Table 3.

The Laboratory will utilize an established system for sample check-in, sample tracking, laboratory analyses assignment and performance, and sample check-out. The system will allow management review of the laboratory data before the issuance of laboratory reports. The management review will be accomplished on two levels: review of raw data for each analysis, and review of the final results to check for consistency or agreement of the results between parameters. Computers are routinely used for this purpose to take advantage of fast retrieval of information.

Upon receipt of samples accompanied by a COC form identifying the analytical parameters to be performed, the Laboratory Coordinator or a delegate will conduct the following:

- Log in the samples and assign Laboratory identification numbers. For each sample, a record will be generated containing the sample station number, sample description, analytical requirements, pricing information, and report format description.
- Enter these data into the Laboratory computer system.
- Prepare an analysis assignment sheet, noting the analytical parameters to be run and providing spaces for resulting analytical data.
- Assign the samples a position in the Laboratory workload backlog.
- Retain the COC form upon completion of data generation.

B4 ANALYTICAL METHODS

Laboratory analytical methods for the chemical analysis of soil samples collected during this investigation will include TPH, VOCs, SVOCs, PCBs as Aroclors, and TAL metals. Samples and QC samples shall be analyzed following the analytical methods listed in Table 3, using laboratory instruments prescribed in the methods. The analytical methods must meet the technical acceptance criteria specified by the method prior to the analysis of environmental samples. Samples that are not analyzed initially (i.e. placed on “hold”) will be stored at the laboratory for up to 6 months, and will be disposed of by the laboratory following this period. Samples to be analyzed initially will be analyzed within proper holding times, which are listed in Table 3.

The laboratory is required to comply with their current written standard operating procedures. Individuals responsible for corrective actions are listed in Section A4. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data to the laboratory project manager. A narrative describing the anomaly, the steps taken to identify and correct it, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package.

EPA Method 5035 will be used for sampling for VOCs in the field. Disposable plungers will be used to collect the correct amount of soil for each sample.

B5 QUALITY CONTROL

Quality control activities that will be implemented for each sampling, analysis or measurement technique are summarized in Table 4. Formulas for calculating QC statistics are provided in Section A7.

The Laboratory will maintain and implement documented QA/QC procedures. The laboratory QA/QC program will provide the following:

- Procedures that must be followed for certifying the precision and accuracy of the analytical data generated by the Laboratory.
- Documentation of each phase of sample handling, data acquisition, data transfer, report preparation, and report review.
- Accurate and secure storage and retrieval of samples and data.
- Detailed instructions for performing analyses and other activities affecting the quality of analytical data generated by the Laboratory.
- Appropriate management-level review and approval of procedures, revisions to procedures, and control of procedures in such a way that laboratory personnel that require specific procedures have access to them.

A summary of MRLs and MDLs for the Target Analytes are listed in Table 2.

B6 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

B6.1 Field Instrumentation

Field instrumentation used during this project includes a PID and oil/water interface probe. The PID is maintained as needed by an outside servicer qualified to maintain such devices. The interface probe is maintained in a clean condition.

Field instrument calibration and calibration checks facilitate accurate and reliable field measurements. The calibration of the PID used on the project will be checked and adjusted as necessary in general accordance with the manufacturer's recommendations. Methods and intervals of calibration checks and instrument maintenance will be based on stability characteristics, required accuracy, intended use, and environmental conditions. The basic calibration check frequencies are described below.

The PID used for headspace vapor screening will be calibrated at the start of each day it is used. The PID is calibrated to 100 ppm isobutylene. Calibration check and calibration results will be recorded in the field notebook. In the event that the instrument will not calibrate properly, spare parts are available with the PID for minor field maintenance. If the instrument cannot be made to work based on available equipment, a separate instrument will be shipped to the field team and the non-calibrating instrument will not be used.

The interface probe is checked before each time it is placed into a well with a test button. In the event the interface probe test indicates the probe may not be working correctly, a separate probe will be shipped to the field team and the non-working probe will not be used.

Equipment is visually inspected before use by the On-Site Field Coordinator to ensure it is clean and in good working condition. Inspection includes visual inspection of the outside of the equipment, and battery checks.

B6.2 Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's SOPs. Calibration documentation will be retained at the laboratory.

Instruments and equipment used during laboratory sample analysis will be operated, calibrated and maintained according to the manufacturer's guidelines and recommendations as well as criteria set forth in the applicable analytical methodology and or in accordance with the laboratory's QA manual and SOPs.

B7 INSTRUMENT/EQUIPMENT CALIBRATION AND FREQUENCY

All laboratory instrument calibrations and their appropriate chemical standards are to comply with the specific methods within EPA SW-846, Test Methods for Evaluating Solid Waste, Physical and Chemical Methods, 3rd Edition, December 1996 and the Laboratory SOPs. Calibration documentation, initial (ICALs) and continuing (CCALs), will be retained at the Laboratory. Deficiencies to be resolved are the responsibility of the Laboratory Project Manager.

B8 INSPECTION/ACCEPTANCE OF SUPPLIES AND CONSUMABLES

The On-Site Field Coordinator is responsible for ensuring that field supplies and consumables are available on Site. Field equipment and consumables generally originate from the supply room, which is re-stocked by suppliers as necessary. Laboratory containers are supplied by the laboratory. The On-Site Field Coordinator will track, retrieve and inspect these materials.

Laboratory reagents will be of sufficient quality to minimize or eliminate laboratory blank background concentrations of the specific analytes to be measured. Reagents must also not contain other contaminants that may interfere with the analysis for the analytes of interest. All sample containers will be provided by the laboratory. All containers will be certified clean, verified with laboratory analysis. The Laboratory Project Manager is responsible for maintaining laboratory supplies.

B9 NON-DIRECT MEASUREMENTS

A substantial quantity of data has previously been collected at the Site. The previously collected data will be used in conjunction with the data collected during this investigation to delineate the nature and extent of contamination on the western portion of the Site. The previously collected data that will be used includes observations present on investigation logs as well as chemical analytical data that has previously been reported in the draft and draft final EE/CAs prepared for the Site (Golder 2010 and E&E 2010). As the data has previously been utilized for Site characterization as presented in the EE/CAs, it is considered of adequate quality for the purposes of this investigation.

B10 DATA MANAGEMENT

The data generated by the Laboratory will be managed in accordance with the procedures outlined in this QAPP and applicable Laboratory operating procedures. The Laboratory Manager is responsible for laboratory record-keeping, document control, and delivery of reliable and accurate data. Data management procedures are described below.

B10.1 Data Collection

In addition to the sampling data recorded on the chain-of-custody forms, data describing the processing of samples will be accumulated in the Laboratory and recorded in Laboratory notebooks. Laboratory notebooks will contain the following information:

- Date of sample processing.
- Laboratory sample numbers.
- Analyses or operations performed for the samples.
- Calibration data applicable to the sample analysis.
- Quality control samples applicable to the sample analysis.
- Concentrations and required dilutions for the analysis.
- Instrument readings.
- Any special observations.
- The analyst's signature.

B10.2 Data Reduction

Data reduction consists of calculating concentrations in samples from the raw data produced by the measuring instruments, and it will be performed by individual analysts assigned to the project. The complexity of the data reduction is dependent on specific analytical methods and the number of discrete operations (extractions, dilutions, and concentrations) involved in obtaining a sample concentration that can be measured.

For methods relying on a calibration curve, sample responses will be applied to the linear regression line to obtain an initial raw result that will be factored into method-specific equations to obtain an estimate of analyte concentrations in the original sample. Rounding will not be performed until after the final result is obtained to minimize rounding errors, and results will not normally be expressed in more than two (2) significant figures.

Upon completion of a set of analyses, calculations will be completed and checked by the analyst. The associated QC data derived from the analysis of method blanks, blank spikes, and duplicates will be entered onto QC charts and verified to be within control limits. If they are acceptable, the data will be entered into the laboratory computer system and data summaries (notebook pages, final concentrations) will be submitted to the Laboratory Project Manager for review. After approval, data are manually entered into a computer, using a Microsoft Excel® or equivalent format. If QC samples do not meet acceptance criteria, the Laboratory Project Manager will be notified, and corrective actions taken, as appropriate. Acceptable data will be submitted to the

Laboratory Project Manager for review. After Laboratory Project Manager approval, the Data Management Coordinator will be notified that the data are ready to be reported, and the completed analyses can be removed from the laboratory backlog.

The Laboratory Project Manager will generate a hard copy data summary that will be reviewed and signed by the Laboratory Project Manager and the Laboratory Coordinator.

Copies of the raw data and the calculations used to generate the final results will be retained on file to allow reconstruction of the data reduction process at a later date, if necessary.

B10.3 Data Review

System reviews will be performed at all levels. The individual analysts will review the quality of data through calibration checks, quality control sample results, and performance evaluation samples.

The final routine review is performed by the Laboratory Project Manager prior to reporting the results to the client. Non-routine audits are performed by regulatory agencies and client representatives. The level of detail and the areas of concern during these reviews will be dependent on the specific program requirements.

B10.4 Data Reporting

Laboratory reports will contain final analytical results (uncorrected for blank contamination and out-of-control recoveries), identification of the analytical methods used, levels of detection, surrogate and matrix spike recovery data, and method blank data. In addition, special analytical problems and/or any modifications of the referenced methods will be noted. The number of significant figures reported will be consistent with the limits of uncertainty inherent in the analytical method.

Data are normally reported in units commonly used for the analyses performed. Concentrations in solids are expressed in terms of weight per unit weight, milligrams per kilogram (ppm for inorganics) or micrograms per kilogram (ppb for organics).

mg/kg = ppm
μg/kg = ppb

Illustrated unit conversions follows:

1 mg/kg ⇨ 1000 μg/kg
1 μg/kg ⇨ .001 mg/kg

B10.5 Electronic Deliverables

Upon completion of analyses, the Laboratory shall prepare electronic deliverables for all packages in accordance with the specifications in this QAPP. The Laboratory shall provide electronic deliverables no later than two (2) business days after receipt of final analytical results. Final analytical results will be provided by the Laboratory within 10 days of the receipt of the samples.

The Electronic Data Deliverable (EDD) should follow the EQuIS Chemistry 4-file format. Specific details regarding data types, valid values, and field definitions are referenced in the Lab Specification. A template of the EQuIS 4-file format (provided upon request) includes a list of valid values and must be obtained in order to ensure the correct use of codes. The template spreadsheet contains four tabs, each with a format for importing various data into different parts of the EQuIS Chemistry data structure and four tabs containing valid values. Ultimately, the EDDs provided by the Laboratory must be delivered as text (.txt), comma-delimited (.csv), or Excel files.

Electronic files will be delivered via e-mail with a supporting hard copy to GeoEngineers. Electronic files will be reviewed by GeoEngineers to determine if the specifications in this section have been followed. If a file format or structure does not meet specifications, GeoEngineers may request a complete re-submittal at no additional cost. Upon reviewing the electronic file, GeoEngineers may also require a re-submittal based on inconsistencies (hereafter referred to as an "error") in code, spelling or missing information.

Each EDD package (a package being a sample delivery group [SDG]) may be delivered as separate files or as a single Excel workbook. Both methods require four file types: one type for samples, one for tests, one for results, and one for batches. If the separate file method is used, the following nomenclature must be followed in the file name - [SDG]_EFW2Lab[type].[extension] where:

SDG = sample delivery group (i.e. lab package ID)

type = one of the following: SMP for sample data, TST for test data, RES for result data, BCH for batch data

extension = the file extension (e.g. .xls, .csv, .txt)

For example, for sample delivery group K1234 the files would be: K1234_EFW2LabSMP.xls, K1234_EFW2LabTST.xls, K1234_EFW2LabRES.xls, and K1234_EFW2LabBCH.xls.

The Laboratory will maintain on file all of the raw data, laboratory notebooks, and other documentation pertinent to the work on the project. This file will be maintained for a period of five years from the date of the project, unless a written request is received for an extended retention time.

B10.6 Data Archival and Retrieval

The Laboratory will utilize an established system for data archival and retrieval. Computers are routinely used for this purpose to take advantage of fast retrieval of information. Data will be stored in-office and off site in a backup location. Hardware and software will be suitable to the secure archival and retrieval of information.

GROUP C – ASSESSMENT AND OVERSIGHT
C1 ASSESSMENTS AND RESPONSE ACTIONS

C1.1 Review of Field Documentation and Laboratory Receipt Information

Documentation of field sampling data will be reviewed daily or within two days by the Project Manager for conformance with project QC requirements described in this QAPP. Minor corrective actions will be addressed by the Project Manager. Major discrepancies will be reported to the Regulatory Project Manager, who has the authority to issue stop work orders. Major discrepancies will be documented in the final report, along with the reason for the discrepancies and any corrective actions. At a minimum, the Project Manager will check field documentation for the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation, and volume;
- Field QC samples collected at the frequency specified;
- COC protocols; and
- Sample shipment information.

Sample receipt forms provided by the laboratory will be reviewed by the Project Manager or Quality Assurance Leader for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

C1.2 Response Actions for Field Sampling

The On-Site Field Coordinator, or a designee, will be responsible for correcting equipment malfunctions or requesting new equipment throughout the field sampling effort and resolving situations in the field that may result in nonconformance or noncompliance with the QAPP. Corrective measures will be documented in the field notebook.

C1.3 Corrective Action for Laboratory Analyses

The Laboratory is required to comply with their current written standard operating procedures. The Laboratory Project Manager will be responsible for ensuring that appropriate corrective actions are initiated as required for conformance with this QAPP. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data to the Laboratory Project Manager. A narrative describing the anomaly, the steps taken to identify and correct it, and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package.

C2 REPORTS TO MANAGEMENT

The fieldwork including test pit excavation, depth to product/depth to groundwater measurements in Site wells and piezometers and decommissioning of the former domestic water supply well is expected to be performed in about one week. The Project Manager will provide status reports to the Regulatory Project Manager on an as-needed basis (i.e. if the Regulatory Project Manager requests such reports). These reports will be in the form of phone calls and/or email. Status reports will include a brief discussion of activities performed to date and major findings.

GROUP D – DATA VALIDATION AND USABILITY

D1 DATA REVIEW, VERIFICATION AND VALIDATION

The data validation and usability elements of the QAPP as detailed below address the QA/QC activities that occur after data collection and/or data generation is complete. Implementation of these elements ensures that the data conform to the specified criteria and will achieve the project objectives. Data validation will be performed in general accordance with the two EPA documents, USEPA Contract Laboratory Program National Functional Guidelines for *Organic* and *Inorganic* Data Review (EPA, 1999 and 2004).

The data are not considered final until validated. All data, including laboratory and field QC sample results, will be summarized in a data validation report. Specific acceptance criteria are discussed in Section A7. The data validation report will focus on data that did not meet the MQOs specified in Table 1. The data validation report will also describe any deviations from this QAPP and actions taken to address those deviations.

Full laboratory data packages will be obtained for all soil samples analyzed. These data packages will include all formal Contract Laboratory Program (CLP) summary forms, and they will also include all instrument raw data from the chemical analyste. GeoEngineers will conduct an EPA Stage “2B” level validation on all data packages. These data will be reviewed for the following QC parameters:

- Holding times and sample preservation
- Method blanks
- MS/MSD analyses
- LCS/LCSD analyses
- Surrogate spikes
- Duplicates/replicates
- Field/Lab duplicates
- Calibrations (Initial and Continuing)
- Internal Standards
- Instrument Tunes

In addition to these QC parameters, other documentation such as sample receipt forms and case narratives will be reviewed to evaluate laboratory QA/QC.

D2 VERIFICATION AND VALIDATION METHODS

The Quality Assurance Leader will verify and validate data received from the laboratory. Any issues will be discussed with the Laboratory Project Manager and/or the Project Manager, if needed. Issues will be resolved by these individuals. The final data validation report will document the results of any issue resolution process.

Hard-copy laboratory reports will provide the analysis-specific information including final sample analytical results, reportable field and laboratory QA/QC analytical results, MDLs and MRLs. The laboratory data will also be reported via electronic media using the tabular outputting capabilities of standard software formats.

The term "reporting limit" will be used interchangeably with "quantitation limit" to mean the lowest concentration at which an analyte can be quantified subject to the quality control criteria of the analytical method. These terms are different from "MDL," which refers to the lowest concentration that the analytical method can ideally detect.

The Quality Assurance Leader will be responsible for overseeing data validation qualifiers including but not limited to "U," "J,", and "R" to explain final data quality issues affecting the laboratory data for the data user. The validation process will take any specific laboratory qualifiers, and any other laboratory quality control issues into consideration when applying and creating this final set of usable qualifiers, as described in the EPA document "Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use" (EPA, 2009). The qualifiers U, J and R are explained as follows::

- "U" indicates that a compound was analyzed for but not detected. The associated numerical value is the estimated sample quantitation limit, which is corrected for dilution and percent moisture.
- "J" indicates that a compound was detected below the reporting limit and the value is estimated or the value was estimated by the validator because of instrument bias reasons.
- If any target analytes are found in a laboratory method blank, it will be regarded as blank contamination. In these cases, the result of a given analyte in the method blank will be compared to any positive result of the same analyte in the associated field samples. If a field sample result is less than five times (ten times for common laboratory contaminants like acetone, phthalates, etc.) the result that is reported in the method blank, the result will be considered blank contamination. Accordingly, the result will be qualified as not-detected "U" at the elevated reporting limit.

If there are two analyses reported by the laboratory for one sample (as in the case of dilutions), the validator will make a decision as to which analysis to use in the final assessment. As there should be only one reported result per analyte for a given sample, any extraneous results will be qualified as not-reportable "R" and will not be used.

D3 RECONCILIATION WITH USER REQUIREMENTS

A data validation report will be produced by the project Quality Assurance Leader to identify cases where the projects MQOs were not met. The data validation report will include a discussion of the uncertainty and limitations of the data.

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TABLE 1

MEASUREMENT QUALITY OBJECTIVES

AVERY LANDING SITE

AVERY, IDAHO

Laboratory Analysis	Reference Method	Check Standard (LCS) %R Limits[2,3] Soil	Check Standard (LCS) %R Limits[2,3] Water	Matrix Spike (MS) %R Limits[3] Soil	Matrix Spike (MS) %R Limits[3] Water	Surrogate Standards (SS) %R Limits [1,2,3] Soil/Water	MS Duplicate Samples or Lab Duplicate RPD Limits[4] Soil	MS Duplicate Samples or Lab Duplicate RPD Limits[4] Water	Field Duplicate Samples RPD Limits[4] Soil	Field Duplicate Samples RPD Limits[4] Water
Diesel- and Heavy oil-range Hydrocarbons	**Ecology NWTPH-Dx with silica gel/acid wash cleanup**	**50%-150%**	**50%-150%**	**NA**	**NA**	**50%-150%**	**≤40%**	**≤40%**	**≤35%**	**≤20%**
VOCs	EPA 8260	70%-130%	70%-130%	70%-130%	70%-130%	70%-130%	≤30%	≤30%	≤35%	≤20%
SVOCs	EPA 8270	70%-130%	70%-130%	70%-130%	70%-130%	70%-130%	≤30%	≤30%	≤35%	≤20%
PCBs	EPA 8082 Modified	70%-130%	70%-130%	70%-130%	70%-130%	70%-130%	≤40%	≤40%	≤35%	≤20%
Metals	EPA 6010/7060/7470/7471/7421	80%-120%	80%-120%	75%-125%	75%-125%	NA	≤20%	≤20%	≤35%	≤20%

Notes:

Method numbers refer to EPA SW-846 Analytical Methods or Washington State Department of Ecology (Ecology) recommended analytical methods.

[1] Individual surrogate recoveries are compound specific.

[2] Recovery ranges are estimates.

[3] Percent Recovery Limits are expressed as ranges based on laboratory control limits. Limits will vary for individual analytes.

[4] RPD control limits are only applicable if the concentrations are greater than 5 times the method reporting limit (MRL). For results less than 5 times the MRL, the difference between the sample and duplicate must be less than 2X the MRL for soils and 1X the MRL for waters.

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

PCBs = Polychlorinated biphenyls

LCS = Laboratory Control Sample

MS/MSD = Matrix Spike/Matrix Spike Duplicate

RPD = Relative Percent Difference

NA = Not Applicable

TABLE 2

REPORTING LIMITS AND SCREENING VALUES FOR SOIL SAMPLES

AVERY LANDING SITE

AVERY, IDAHO

Analyte	Method Detection Limit[1]	Method Reporting Limit[1]	Screening Value[2]
Metals (mg/kg)			
Aluminum	3.55	5	77,000
Antimony	0.32	5	4.8
Arsenic	0.46	5	0.39
Barium	0.06	3	896
Beryllium	0.01	0.1	1.6
Cadmium	0.11	0.2	1.4
Calcuim	1.89	5	NE
Chromium	0.27	5	2,135
Cobalt	0.03	0.3	23
Copper	0.05	0.2	921
Iron	0.75	5	5.8
Lead	0.13	2	50
Magnesium	1.38	5	NE
Manganese	0.04	0.1	223
Mercury	0.0013	0.025	0.0051
Nickel	0.3	1	59
Potassuim	17.43	50	NE
Selenium	0.65	5	2.0
Silver	0.03	0.3	0.19
Sodium	1.06	50	NE
Thallium	0.53	5	1.6
Vanadium	0.06	0.3	390
Zinc	0.12	1	886
Petroleum Hydrocarbons (mg/kg)			
Diesel-range petroleum hydrocarbons	1.31	10	NE
Heavy-oil range petroleum hydrocarbons	0.665	10	NE
Volatile Organic Compounds (ug/kg)			
Dichlorodifluoromethane	0.207	1	2,960
Chloromethane	0.263	1	23.1
Vinyl Chloride	0.235	1	9.63
Bromomethane	0.187	1	50.1
Chloroethane	0.462	1	53.3
Trichlorofluoromethane	0.266	1	1,040
Acrolein	3.809	50	9.65
Acetone	0.482	5	17,400
1,1,2-Trichloro-1,2,2-Trifluoroethane	0.287	2	NE
1,1-Dichloroethene	0.336	1	38.8
Bromoethane	0.44	2	NE
Methylene Chloride	0.635	2	16.9
Carbon Disulfide	0.559	1	5,970
Acrylonitrile	1.026	5	0.194
Methyl-t-butyl ether (MTBE)	0.231	1	36.4
trans-1,2-Dichloroethene	0.266	1	365
Vinyl Acetate	0.381	5	NE
1,1-Dichloroethane	0.203	1	3,480
2-Butanone	0.513	5	11,800
2,2-Dichloropropane	0.292	1	NE
cis-1,2-Dichloroethene	0.24	1	193
Chloroform	0.234	1	5.64
Bromochloromethane	0.323	1	2.68
1,1,1-Trichloroethane	0.226	1	2,000
1,1-Dichloropropene	0.312	1	NE
Carbon Tetrachloride	0.213	1	11.4
1,2-Dichloroethane	0.191	1	7.67
Benzene	0.296	1	17.8
Trichloroethene	0.212	1	2.88
1,2-Dichloropropane	0.162	1	8.9
Bromodichloromethane	0.254	1	2.68
Dibromomethane	0.147	1	NE
2-Chloroethyl Ether	0.276	5	NE
4-Methyl-2-Pentanone	0.42	5	17,600
cis-1,3-Dichloropropene	0.226	1	2.45
Toluene	0.151	1	4,890
trans-1,3-Dichloropropene	0.216	1	2.45
1,1,2-Trichloroethane	0.286	1	14.1
1,2-Dibromoethane	0.176	1	NE
2-Hexanone	0.439	5	NE
1,3-Dichloropropane	0.209	1	NE
Tetrachloroethene	0.257	1	28.8
Dibromochloromethane	0.266	1	2.02
Chlorobenzene	0.219	1	618
1,1,1,2-Tetrachloroethane	0.233	1	40.9
Ethyl Benzene	0.202	1	10,200
m,p-Xylene	0.392	1	1,670
o-Xylene	0.224	1	1,670
Styrene	0.138	1	1,830
Bromoform	0.297	1	29.2
Isopropyl Benzene	0.233	1	3,460
1,1,2,2-Tetrachloroethane	0.253	1	0.915

1,2,3-Trichloropropane	0.517	2	0.245
trans-1,4-Dichloro-2-Butene	0.437	5	NE
n-Propyl Benzene	0.272	1	NE
Bromobenzene	0.153	1	NE
1,3,5-Trimethylbenzene	0.254	1	145
2-Chlorotoluene	0.3	1	1,560
4-Chlorotoluene	0.277	1	NE
t-Butylbenzene	0.306	1	852
1,2,4-Trimethylbenzene	0.23	1	193
s-Butylbenzene	0.24	1	1,170
4-Isopropyl Toluene	0.236	1	NE
1,3-Dichlorobenzene	0.227	1	229
1,4-Dichlorobenzene	0.232	1	75.5
n-Butylbenzene	0.262	1	NE
1,2-Dichlorobenzene	0.293	1	5,250
1,2-Dibromo-3-Chloropropane	0.586	5	0.975
1,2,4-Trichlorobenzene	0.332	5	692
Hexachloro-1,3-Butadiene	0.41	5	37.8
Naphthalene	0.429	5	1,140
1,2,3-Trichlorobenzene	0.305	5	NE
Semi-Volatile Organic Compounds (ug/kg)			
Phenol	16.1	67	7,360
Bis(2-Chloroethyl)ether	16.9	67	0.108
2-Chlorophenol	14.3	67	365
1,3-Dichlorobenzene	15.7	67	229
1,4-Dichlorobenzene	15.6	67	75.5
1,2-Dichlorobenzene	18.4	67	5,250
Benzyl alcohol	86.6	330	6,430
2,2'-oxybis(1-Chloropropane)	18.7	67	NE
2-Methylphenol	23.3	67	1,800
Hexachloroethane	18.8	67	138
N-Nitroso-di-n-propylamine	20.8	67	NE
4-Methylphenol	22.4	67	141
Nitrobenzene	25.6	67	21.8
Isophorone	13.4	67	140
2-Nitrophenol	63.4	67	NE
2,4-Dimethylphenol	16.2	67	819
Bis(2-Chloroethoxy)methane	17.3	67	NE
2,4-Dichlorophenol	74.7	330	97.8
1,2,4-Trichlorobenzene	15.9	67	692
Naphthalene	14.9	67	1,140
Benzoic acid	251	670	7,710
4-Chloroaniline	99.7	330	126
Hexachlorobutadiene	18.8	67	37.8
4-Chloro-3-methylphenol	115	330	NE
2-Methylnaphthalene	24.4	67	3,310
Hexachlorocyclopentadiene	62.4	330	11.6
2,4,6-Trichlorophenol	142	330	4.36
2,4,5-Trichlorophenol	150	330	7,380
2-Chloronaphthalene	21.3	67	128,000
2-Nitroaniline	120	330	72.5
Acenaphthylene	21.1	67	78,000
Dimethylphthalate	26.5	67	271,000
2,6-Dinitrotoluene	95.7	330	0.212
Acenaphthene	16.4	67	52,300
3-Nitroaniline	104	330	3.18
2,4-Dinitrophenol	77.4	670	38.4
Dibenzofuran	18.2	67	6,100
4-Nitrophenol	48.2	330	226
2,4-Dinitrotoluene	96.1	330	0.29
Fluorene	15.6	67	54,800
4-Chlorophenyl-phenylether	20.5	67	NE
Diethylphthalate	20.9	67	27,500
4-Nitroaniline	102	330	2.99
4,6-Dinitro-2-methylphenol	122	670	NE
N-Nitrosodiphenylamine	20.8	67	NE
4-Bromophenyl-phenylether	19.3	67	5.45
Hexachlorobenzene	18.9	67	42.7
Pentachlorophenol	96.4	330	9.07
Phenanthrene	20	67	79,000
Anthracene	20.2	67	1,040,000
Carbazole	14.7	67	NE
Di-n-butylphthalate	33.1	67	31,000
Fluoranthene	41.6	67	364,000
Pyrene	46.8	67	359,000
Butylbenzylphthalate	24.6	67	511,000
Benzo(a)anthracene	19.4	67	422
3,3'-Dichlorobenzidine	89	330	1.83
Chrysene	21	67	33,400
bis(2-Ethylhexyl)phthalate	23.9	67	11,800
Di-n-octylphthalate	19.1	67	183,000
Benzo(a)pyrene	0.94	5	42.2
Indeno(1,2,3-cd)pyrene	27	67	422
Dibenzo(a,h)anthracene	24.6	1.33	5
Benzo(g,h,i)perylene	25.9	67	1,180,000
1-methylnaphthalene	28.8	67	NE

Polychlorinated Biphenyls (ug/kg)			
Aroclor 1016	9.33	33	2,330
Aroclor 1221	NA[3]	NA[3]	2.94
Aroclor 1242			3.18
Aroclor 1248			137
Aroclor 1254			740
Aroclor 1260	7.066	33	147

Notes:

[1] Values from Analytical Resources (ARI), Inc. of Tukwila, Washington.

[2] Screening values based on Idaho Department of Environmental Quality Initial Default Target Levels (2004).

[3] A mixture of Aroclors 1016 and 1260 (1660) contains PCB congeners that cover the full chromatographic range of the Aroclors 1016, 1221, 1232, 1242, 1248, 1254 and 1260. EPA Method 8082A describes the use of 1660 to determine the linearity and sensitivity for the full range of Aroclors. When Aroclors other than 1016 or 1260 are identified they are quantified using a single point calibration based on the linearity and sensitivity determined using 1660. Following this reasoning, ARI normally performs limit of detection (LOD) studies only for Aroclors 1016 and 1260.

NE = Not established

NA = Not available

Shading indicates the method reporting limit is greater than the screening value

TABLE 3

TEST METHODS, SAMPLE CONTAINERS, PRESERVATION AND HOLDING TIME

AVERY LANDING SITE

AVERY, IDAHO

Analyte	Method	Minimum Sample Size	Sample Containers	Sample Preservation	Holding Times
Diesel- and Oil-Range Hydrocarbons	Ecology NWTPH-Dx with silica gel/acid wash cleanup	8 oz	8 or 16 oz glass wide-mouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 40 days from extraction to analysis
VOCs	EPA 8260	2 oz	4 or 8 oz glass widemouth with Teflon-lined lid and 5035 kit with methanol preserved vial and two dry vials	Cool 4°C	48 hours to freeze samples in laboratory then 14 days
SVOCs	EPA 8270 (SIM)	8 oz	4 or 8 oz glass widemouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 40 days from extraction to analysis
PCBs	EPA 8082 Modified	8 oz	4 or 8 oz glass widemouth with Teflon-lined lid	Cool 4°C	14 days to extraction, 40 days from extraction to analysis
Metals**	EPA 6010/7060/7470/7471/7421	4 oz	4 or 8 oz glass widemouth with Teflon-lined lid	Cool 4°C	180 days/ 28 days for Mercury

Notes:

Holding Times are based on elapsed time from date of collection.

**Metals to be analyzed are EPA TAL list (see Table 2)

VOCs = Volatile organic compounds

PCBs = polychlorinated biphenyls

oz = ounce

mL = milliliter

L = liter

g = gram

TABLE 4

QUALITY CONTROL SAMPLES - TYPE AND FREQUENCY

AVERY LANDING SITE

AVERY, IDAHO

Parameter	Field QC		Laboratory QC			
	Field Duplicates	Trip Blanks	Method Blanks	LCS	MS / MSD	Lab Duplicates
Diesel- and Oil-Range Hydrocarbons with silica gel/acid wash cleanup	**1/20 soil samples**	**NA**	**1/batch**	**1/batch**	**NA**	**1/batch**
VOCs	1/20 soil samples	1/cooler	1/batch	1/batch	1 set/batch	NA
SVOCs	1/20 soil samples	NA	1/batch	1/batch	1 set/batch	NA
PCBs	1/20 soil samples	NA	1/batch	1/batch	1 set/batch	NA
Metals*	1/20 soil samples	NA	1/batch	1/batch	1 MS/batch	1/batch

Notes:

An analytical lot or batch is defined as a group of samples taken through a preparation procedure and sharing a method blank, LCS, and MS/ MSD (or MS and lab duplicate). No more than 20 field samples can be contained in one batch.

LCS = Laboratory control sample

MS = Matrix spike sample

MSD = Matrix spike duplicate sample

VOCs = Volatile organic compounds

SVOCs = Semi-volatile organic compounds

PCBs = polychlorinated biphenyls

*Metals to be analyzed are EPA TAL list (see Table 2)

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